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METHOD OF TREATING WOOD AND WOOD PRODUCTS THUS TREATED
[WERKWIJZE VOOR HET BEHANDELEN VAN HOUT EN ALDUS BEHANDELDE HOUTEN VOORTBRENGSELEN]

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The invention concerns a method for treating wood with an /1*
aqueous solution that contains both potassium bifluoride and ammonium bifluoride, from which a gas is released.

The invention also concerns wood articles thus treated.

Treatment of wood with an aqueous solution that contains both potassium bifluoride and ammonium bifluoride, from which a gas is released, is known from German patent 915863, French patent 891497, and Swiss patent 306709. The objective of these patent publications is to counteract injury of the wood by insect damage and fungus attack; in these cases the harmful organisms, as it were, are poisoned.

Although the earlier inventions answer the objectives of countering fungus attack and insect damage, they ignore improving the internal properties of the wood with respect to improving and maintaining the moisture regulation in the case of long-term applications. In the first place, structural applications, for example as construction components, are to be considered here.

The invention is based on a discovery that by treating wood with an aqueous solution that contains both potassium bifluoride and ammonium bifluoride, from which a gas is released upon contact with wood, which gas then diffuses into the wood and the wood acquires an unexpectedly greater durability after reaching a gas absorption and a dry equilibrium, the wood obtaining a unexpectedly greater durability.

The capacity to contain liquid of the three most interesting components of which wood consists, that is, cellulose, hemi- /2

*Numbers in the margin indicate pagination in the foreign text.

cellulose, and lignins, influences the hygroscopicity of wood.

The hygroscopic properties of wood to absorb remaining liquid and lend stability are stabilized by the new treatment as a result of the previously unknown action of the bifluoride ion = (FHF) described below. The stabilized properties of the "healthy (rot-free wood) wood = healthy wood" thus treated are the consequence of absorption and bonding of the (FHT) in the wood, which (FHF) exhibits a water-repellent effect. The (FHF) possesses the strongest hydrogen bond, while the equilibrium position of the bifluoride ion is linear (180.0°). The bond of the (FHF) to the wood tissue, in which it is surrounded by wood - as well as water molecules, appears to be extremely stable, while the dissociation into HF and F is zero. As a consequence of the structure, the stability, and the fact that the HF remains in the wood, the F is optimally bonded to the wood because of the (FHF) present.

This is because the (FHF) remaining in the wood lasts, and as research confirmed, it can extend the service life of the wood.

This is due to the fact that the HF bound in the (FHF) dehydrates the wood.

The existing capacity of the treated wood to absorb and release moisture and moisture fluctuation resulting from this always remains, which extends the service life of the wood.

As a result of the bound (FHF), after fairly rapid drying and then after becoming wet again, the wood also will rapidly dehydrate again.

Thus there is no negative moisture loading that can impair the /3
structural and hygroscopic properties that healthy wood naturally possesses.

The above-mentioned treatment gives wood and in particular coniferous wood a service life that amounts to more than 20 years.

This permanently healthy wood makes it possible to justify long-term use as a result of the service life extension thus achieved.

Because the (FHF) system does not dissociate, the physical properties of healthy wood present before the immersion remain unchanged by the dehydration taking place after the drying.

It is noted that in Swiss patent 306709 an attempt was made to bring as much bifluoride as possible into the wood by repeatedly spraying the wood with a solution as concentrated as possible, the wood being kept moist between the irrigations. The wood is kept moist by preventing gases formed out of the "fluoride salts" from escaping. Equilibrium adjustment of the fluorine compound, called "gasses" here for the sake of convenience, in the case of absorption into the wood, is not known from any of the above-mentioned patent publications.

By making use of a "gas absorption equilibrium" adjustment in the wood, in general, of course, less bifluoride salt is necessary, which is an advantage of the invention at issue, both because of cost and environmental reasons. In connection with the environment, processing used wood that is not considered to be chemical waste is also considered.

The manufacturing of chipboard from wood chips by spraying each chip with an aqueous resin solution, then sprinkling gas-releasing salt, such as potassium bifluoride, between the wood chips, is known from Dutch patent application 6811835, German OLS 1792099, and Austrian patent specification 298769. /4

The released gas serves, among other things, for countering mold damage of the panels.

Obtaining very good properties in extending the service life of wood as a result of the action of the (FHF) and by the treatment as indicated above, equilibrium adjustments being pursued, is not yet known.

Leaching tests in water carried out in an official investigation showed that no fluoride compounds leached out of the treated wood, which is a great advantage of the wood treated according to the invention.

It is noted that the treatment of wood according to the invention is a chemical treatment, by which properties stabilizing and prolonging the service life of the wood are obtained and no treatment with a pesticide is required.

The application of the new method aimed at prolonging the service life of the wood considerably expands the area of application of this durable and renewable raw material, which is a favorable environmental effect.

This effect is increased by the fact that little energy is required for producing wood, as opposed to other building and construction materials.

According to a preferred embodiment, potassium bifluoride and ammonium bifluoride are applied in an aqueous solution of 5-35 % by weight, preferably in a concentration between 8-32% by weight.

The amount of bifluorides = FHF absorbed amounts to 0.5-1.7 kg, preferably 0.8-1.2 kg of salt/m^3 wood.

Preferably the new treatment consists of 3-30 minutes of /5
soaking in the aqueous solution of the combined bifluorides, preferably 5-15 minutes. This is followed by 1-20 days of air drying of the wood placed on cross-pieces.

It is noted that because the combined bifluorides rapidly diffuse in gas form into the wood and remain effective in the wood because the (FHF) does not dissociate, no costly pressure-treatment apparatus is necessary.

A rapid thorough penetration into the wood to a depth of 12-25 mm takes place as a result of the above-mentioned method.

After the wood has been removed from the soaking bath, among other things, in the case of the air-drying of the wood placed on the cross-pieces, air-dried pine wood is redried to the initial moisture content after 3-9 days.

After treatment with an aqueous bifluoride solution and possible drying, as noted above, no leaching of fluoride takes place when unprotected wood is placed in water or rain water.

An investigation shows the improved wood-stabilizing properties of the treated wood, because from an equilibrium moisture content of around 30%, this absorbs a few percent faster over the course of time, but however at the same time it also releases it more rapidly than untreated wood.

The wood soaked and dried on cross-pieces can be applied to painted or unpainted wood.

Under certain circumstances this can be favorable for adjusting the new method to components. In this case the components are preferably already placed on the cross-pieces during the soaking.

Components are to be understood as wood parts onto which all processes are carried out. /6

The application of the method to components has the advantage of a thorough practically uniform penetration depth of the (FHF). At the same time placement on the cross-pieces permits rapid drying and application of the treated wood.

The new method is applicable to wood, preferably on coniferous and in particular pine wood.

The new method is also well adaptable to bamboo.

As mentioned above, the invention also includes wood products that are subjected to the method according to the invention.

In accordance with the above, it is noted that the invention includes the treatment of the wood with an aqueous combined bifluoride solution, followed by a treatment in which the FHF is absorbed, both an equilibrium and a dry equilibrium being established.

The treatment of the wood with the aqueous combined bifluoride solution can also take place as a result of a treatment method other than soaking.

In this case spraying or injecting can be considered.

With respect to the treatment method in which the gas absorption-equilibrium and dry equilibrium is established, it is noted that this takes place according to the preferred embodiment in which air-drying of the wood placed on cross-pieces takes place.

If drying on cross-pieces is performed for less than 3 days, there is the risk that bifluoride that is not diffused and/or bonded with the wood is found on the outside of the wood.

Since aqueous combined bifluoride solution can if required contain a moistening agent, although this is superfluous in the /7 vast majority of cases.

As a result of the treatment of wood with bifluorides according to the invention less support is necessary, such as a longer service life of the paint.

CLAIMS /8

1. A method for treating wood with an aqueous solution that contains both potassium bifluoride and ammonium bifluoride, where a gas is released upon contact with wood, wherein (FHF) present in the gas diffuses into the wood and surrounded by wood and water molecules does not dissociate and the wood is dehumidified, that is maintained after a gas absorption equilibrium and a dry equilibrium are obtained.

2. The method according to Claim 1, wherein the wood is treated with an aqueous solution of (FHF), preferably consisting of potassium bifluorides and ammonium bifluorides, amounts of 65 to 40% of potassium bifluorides being mixed with an amount of 35 to 60% of ammonium bifluorides.

3. The method according to Claim 1 or 2, wherein the concentration of the aqueous bifluoride solution lies between 5-35% b weigh, which preferably lies between 8 and 32% by volume.

4. The method according to Claim 1, wherein the concentration amounts to 9.5-10.5 % by weight.

5. The method according to Claim 4, wherein after the treatment the wood is treated for 1-20 days, preferably 3-9 days, of air drying of the wood placed on cross-pieces.

6. The method according to each of the preceding Claims 1-5, wherein the method is applied to components.

7. The method according to each of the preceding claims, wherein the method is applied to wood, in particular coniferous wood, and especially pine wood.

8. The method according to each of Claims 1-6, wherein, it is not wood, but bamboo, that is treated. /9

9. Wooden and bamboo articles, treated according to any of Claims 1 to and including 6.